SPECIALISED MASTER IN INTERNATIONAL AND DEVELOPMENT ECONOMICS

Government spending multiplier in developing countries

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Award date:
2020

Awarding institution:
University of Namur

BELGIUM

UNIVERSITE DE NAMUR

ECONOMICS SCHOOL OF NAMUR

ADVANCED MASTER INTERNATIONAL AND DEVELOPMENT ECONOMICS

PERSONAL PROJECT: GOVERNMENT SPENDING MULTIPLIER IN DEVELOPING COUNTRIES

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JULY, 2020

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I- INTRODUCTION

Esteban Ortiz-Ospina and Max Roser (2020) highlights the public spending as the mechanism that allows the public sector to both produce and purchase goods and services in order to pursue their objectives like providing public goods or redistributing resources. However, Current data available on this area demonstrate a great disparity between countries. Compared to low-income countries, public spending in high-income countries is likely to be significantly heavier (both in per capita terms and as a percentage of GDP), and also tends to be more oriented towards welfare.

Meanwhile, many low-income countries feature public spending having a limited amount of domestic spending and can be financed externally through budget support (foreign aid) or borrowing. The two levels of external financing and local preferences can play a critical role in the transmission of mechanisms to increase the public spending. While an increasing of external funds link to the budget support can be associated with a greater appreciation of the real exchange rate and steeper in the downturn of traded good sectors. A small level of home-based bias is likely to help offset these appreciation and adverse effects on trade output. However, there are no consistent surveys which extent these characteristics to determine the effects of fiscal policy and the related economic output multipliers in Low Income Countries (Shen et al., 2015).

This research will try to contribute to the literature on the government spending multiplier effect in low income countries by identifying the factors that make it weaker than in high income countries. In a second step, we will investigate whether foreign aid makes local spending increase and how it influences the multiplier effect and the local production capacity, for the case of Haiti.

To shed light on the issue, in the first part of this economical paper, we use some empirical papers on this subject to see which factors make the multiplier weaker in some developing countries and we reinforce these facts by the data of world Bank, transparency international and some local data (Case of Haiti) to analyze the situation of multiplier weakness in low income countries. In the second part, we use an input output model (matrix of Leontief) to show if the foreign aid increases the local spending or has positive effect on the multiplier or influences the local production capacity.

This economic paper outlines some relevant factors which can make weaker the local effects of increasing government expenditures in developing economy. We can point out the structure of public spending, the quality of public spending (corruption, rent seeking, ghost workers…) and the weakness of the local structure as key drivers which can make the multiplier low in developing countries. These factors were illustrated with some figures in order to demonstrate the strength of these elements in the governance of public finances of these low-income countries.

Further, by using an input output model, we assume the intra industry remain constant due to the change in the final demand. We analyze the multiplier effect in the local economy where we emphasize the net effect of any additional revenue injected in a specific economy as outcome of spending or employment for a specific industry. We sort out these impacts through direct and indirect effects in the output of the local economy.

This paper is consistent with previous work on the net effect of multiplier of developing countries which stipulates any increase of public spending either through official development assistance, borrowing or other forms of government public investment, the impact of multiplier in these countries will be smaller.

CHARACTERISTICS OF LOW-INCOME COUNTRIES ECONOMIES

According to the World Bank, the Low-Income Countries (LIC) often synonymous with underdeveloped countries are considered as countries that have a GDP per capita of less than 1,025 USD. These countries are recipients of so-called development assistance, i.e. financial aid provided by governments or agencies to stimulate and support economic, political, social and environmental development in other countries. These financial supports can be bilateral or multilateral. Bilateral aid is given directly from the donor country to another, and multilateral aid is given to an international organization which then distributes the aid to developing countries. World Bank and United Nations agencies such as UNICEF or UNESCO are examples of organizations that are involved in development aid. Actually, the World Bank has identified 31 Low Income Countries in the world spread out as follows: Africa (25 countries); America (1) and Asia (5).

Table 1: List of LOW INCOME COUNTRIES IN THE WORLD

LOW-INCOME ECONOMIES ($1,025 OR LESS)

[31]

Afghanistan	Guinea-Bissau	Sierra Leone
Benin	Haiti	Somalia
Burkina Faso	Korea, Dem. People's Rep.	South Sudan
Burundi	Liberia	Syrian Arab Republic
Central African Republic	Madagascar	Tajikistan
Chad	Malawi	Tanzania
Congo, Dem. Rep	Mali	Togo
Eritrea	Mozambique	Uganda
Ethiopia	Nepal	Yemen, Rep.
Gambia, The	Niger	
Guinea	Rwanda	

Source: world Bank, 2017

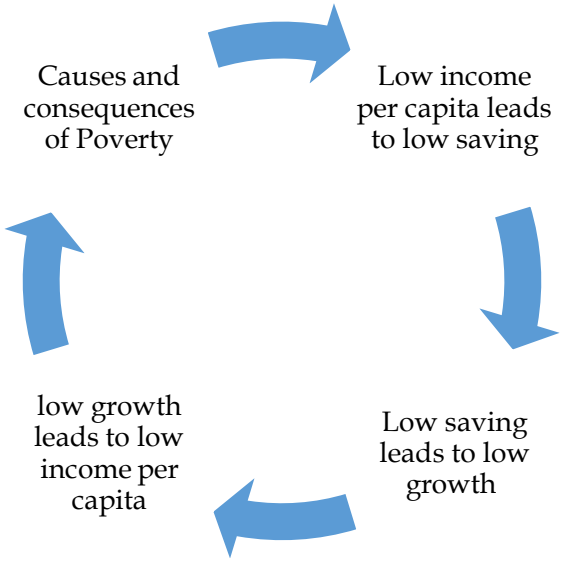
Extensive research on this topic has set out there are seven (7) characteristics for Low Income Countries: Low level income per capita and overall poverty; Predominance of agriculture; Massive unemployment; feeble productivity and others.

a) **Low level of per capita income and overall poverty:** The GDP per capita represent the most relevant indicator of sub development economic. This indicator is very low

in these countries. That is the reason people in these low-income countries do not receive enough food to feed themselves, a good health care and minimum education opportunities. This situation generates 40-50% people of developing countries live below the line of poverty.

b) **Shortage of capital:** considering there are low income per capita, namely more people are poor because they cannot have enough money to save more. These peoples have an upper tendency to consume (or a low propensity to save). Ragnar Nurkse (1960, p.4) has identified that most underdeveloped countries trapped in a poverty trap resume in a nutshell channel.

Figure 1: LIC's Vicious circle



c) **Booming population and high dependency:** The population of Low-Income economy is growing by almost 2 per cent each year. As a result, the land/work ratio has worsened, leading to the development of an excess labor force. These surplus workforces are unproductive in the sense that they are dependent on productive workers. In fact, due to the absence of adequate employment opportunities, the cost of dependency is very significant.

d) **Massive unemployment:** There are a significant number of unemployed, economically underemployed and hidden unemployed. The main sector of these economies (agriculture) is unable to accommodate population growth. As all these factors contribute to the increase in the scale of disguised unemployment in Low Income Countries, the magnitude of this phenomenon is increasing. Not finding alternative employment elsewhere, rural population are migrating to cities in order to subsist. In addition, large numbers of well-educated young people fail to find suitable employment in these origin countries**.**

e) **Predominance of agriculture:** Agriculture represents the main sector of these economies; this sector contributes roughly 30-60% of GDP according some sources combined (worldatlas 2017). Although agriculture has a predominant position in developing countries, it is still trailing in terms of productivity, which results in weak agricultural productivity.

Figure 2: Countries most dependent on Agriculture

Countries Most Dependent on Agriculture

Rank	Country	Agriculture as Percentage of GDP
1	Liberia	76.9
2	Somalia	60.2
3	Guinea-Bissau	55.8
4	Central African Republic	53.1
5	Chad	52.7
6	Comoros	51.6
7	Sierra Leone	51.5
8	Togo	46
9	Ethiopia	41
10	Niger	39
11	Mali	38.8
12	Burma (Myanmar)	38.2
13	Democratic Republic of the Congo	37.5
14	Benin	36
15	Nepal	34.9

Source: World atlas, August 1, 2017

f) **Unproductive investment:** the people in such countries have very a little power to save; the small amount save is not invested properly. These investments will fuel non-income generating activities that are unable to sustain the economic growth.

g) **Low level of productivity:** There are a variety of reasons why land is not productive, which can be related to institutional, technological and environmental issues. Labor productivity is also poor for several reasons. Most employees are poor and do not get adequate food or health care. Therefore, they cannot work intensively. In a nutshell, low labor productivity is both a cause and an effect of low global productivity and living conditions in these countries. Low living standards and low productivity go together. It is tricky, in practice, to identify the cause and the effects.

In summary, these countries often face poor management of public finances where public expenditure is allocated to non-productive sectors of the economy that can be a reason for the underdevelopment of these countries. This project will try to put some insights into the analysis of public spending implication in low income countries.

II- LITERATURE REVIEW

This section is subdivided into two sub-sections. In the first part, we focus on the theoretical framework of multiplier effects, and the other hand we underline the empirical review of the multiplier effect in low income countries.

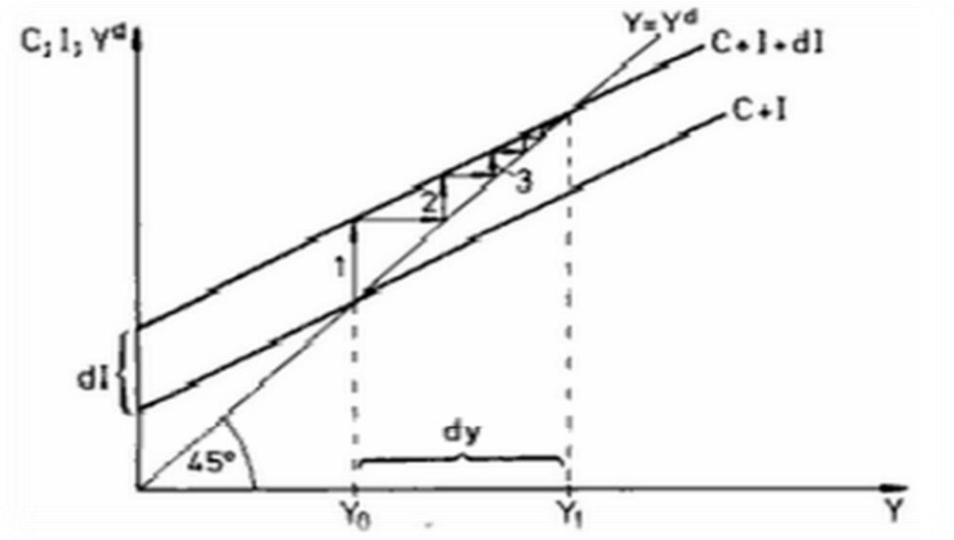
A- Theoretical Framework

Lange (1943) defines the multiplier effect as the marginal effect of a change of one economic variable upon another variable, of which the first variable is a component. For instance, the marginal effect of a change in primary employment upon total employment, or of a change in investment upon a national income. In recent years, multipliers have been applied as tools analysis in a different economics fields as macroeconomics, microeconomics, econometrics and so one in the objective to determine the effect of one economic variable.

For Asimakopulos (1991, p.66), the initial idea behind the multiplier often goes back to John Maynard Keynes. The truth, however, this idea was first introduced by the British

economist Richard Kahn who is the first person to have written an article on the multiplier to see the employment multiplier, while Keynes emphasized the investment multiplier. According to Ehrlinspiel (2011, p.11), the multiplier effect responds to the issue of how an expected increase in income is reflected in Keynes research design. That notwithstanding, it is assumed that an increase in revenues is triggered by an expansion in government spending.

Figure 3: The Multiplier Effect of Government Spending - a Theoretical Approach



Ehrlinspiel (2011, working paper, p.11)

Ehrlinspiel (2011, p 11) illustrates in Figure 3 above that an increase in public spending is reflected in a corresponding upward shift in the effective demand function from the original actual demand from (C+I) to a subsequent effective demand function (C+I+dI). The expression dI stands for difference in investment and will therefore be called G for public expenditure. It should be noted that the effect would be the same if autonomous investment or autonomous consumption suddenly increased. The real effect of G is illustrated by viewing dy, which represents the difference in income caused by government spending G.

Beyond shadow of a doubt, dy is visibly larger than G. Herein is the basis of the Keynesian multiplier effect: the result of an increase in public spending is deemed to be

more significant than the increase itself. The thinking underlying this statement is a gradual process, which is indicated graphically by arrows 1, 2 and 3 ***(see figure 3 above)***. The amount spent by the government triggers an increase in demand since G generates increasing revenues on the supply side and thus stimulates consumption. Then, the increase in income itself generates an increase in consumption and so on. This process is repeated an endless series of times, finally converging to a new equilibrium income Y_0. Consequently, The MPC (Marginal Propensity to Consume) is the most important variable in this theory.

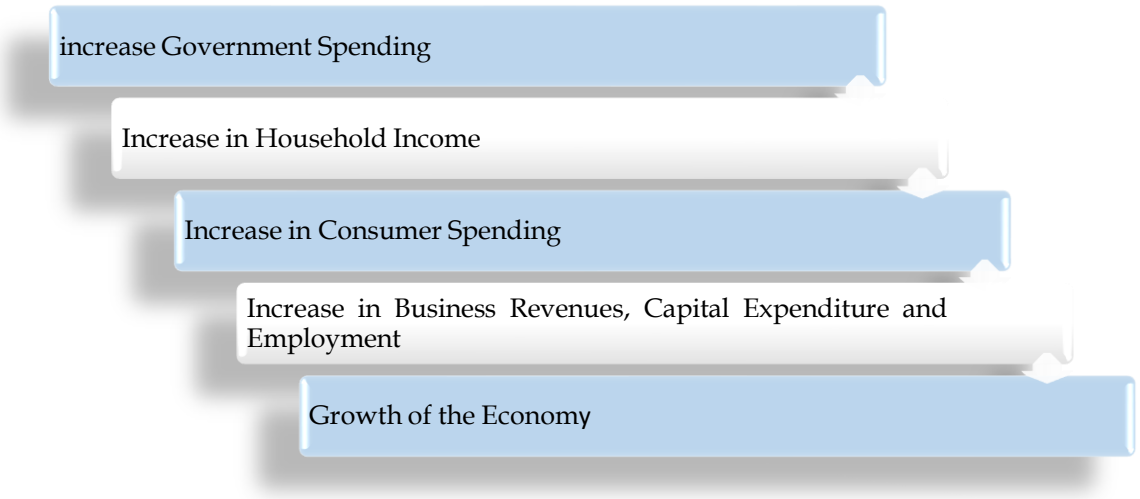
$$Y= \frac{1}{1-c} * (C_0+I_0+G)$$

In summary, the concept of multiplier is captured adequately in the following definition by Ilzetzki et.al. (2011, p.9): overall, the fiscal multiplier is defined as the variation in real GDP or some other measure of output following a one-unit increase in a given fiscal instrument by the government (G or T). For example, if a single dollar increases in public consumption in a given country boosted GDP by fifty cents, the tax multiplier is 0.5

B- Empirical Review

There is a growing body of literature that recognizes the impact of the multiplier effect of government spending that is intended to stimulate the economy. According to the underlying theory, the multiplier effect takes place through the following mechanism: *(i)* an increase in government spending gives additional income to households; *(ii)* additional household income increases consumer spending; *(iii)* an increase in consumption ultimately increases business revenues, production and capital expenditure, and employment all of which contributes to further stimulate the economy. Therefore, the multiplier effect is enough to enhance gross domestic product (GDP), which is larger than the scale of an increase in public spending. (Lange 1943, Asimakopulos 1991 e.g.)

Figure 4: Channels of the multiplier effect in a Nutshell



Source: Muller ISAAC

However, it has been suggested by many researchers that the multiplier effect may not operate in the same way in all countries. For instance, Corsetti et al. (2012), in a working paper published by the IMF, suggest that the effects of government spending vary according to the economic environment. The authors argue that the multiplier effect depends on various features classified into *(i)* exchange rate regime, *(ii)* State of public finances, and *(iii)* State of banking and financial system.

Ilzetzki et al. (2013) define a subunit of 45 countries in a sample of ten (10) years observations by using a VAR model to approach the multiplier effects in different ways. The first review of this paper will go to the public consumption multipliers. Broadly speaking, this refers to the daily expenditure of general government, such as the wages and salaries of teachers, the running costs of hospitals, etc. The first point to consider is the multipliers of public consumption. In developed countries, they discover that the long-run multiplier is 0.66. This implies that for every dollar of additional spending by government, the net benefit to the economy is only 66 cents. For developing countries, the number was even worse. A one-dollar boost in the economy would reduce the GDP by 63 cents. **there is a negative comovement between the GDP in Low Income**

Countries (LIC) and government spending. As Mr. Ilzetzki points out that many developing countries often undergo one year of government expansion, and a subsequent year of government shrinking. And this often hinders the start of a multiplier effects. And the other way, for developing countries, the multiplier on public investment is positive, close to 1 in the medium term. This implies that the design of public spending patterns can potentially play an overwhelming role in determining the impact of tax incentives in low-income countries.

Di Giorgio et al. (2016) also describe the long-run effects of government spending shocks on the real exchange rate through a NOEM model (New Open Economic Macroeconomic), this model tries to overcome the criticism of DSGE model. The NOEM model show specifically the scope of fiscal policies that can be analyzed. The authors found an exogenous increase in public spending has a double effect on real marginal costs. Otherwise, with stronger demand and sticky prices, real earnings have to go up, thereby inducing higher real marginal costs; on the other way, by improving labor productivity, firms become more competitive, and real marginal costs decline. Depending on which effect is dominant, government spending can cause higher or lower inflation, triggering – through the interest rate established by the monetary authorities– an appreciation or a depreciation. Secondly, the author argues that the second effect is larger for a reasonable calibration, and therefore leads to a depreciation of the real exchange rate on the impact and in the medium term, following an increase in public expenditure in a balanced budget (fiscal balance). However, when the increase in public spending is unbalanced, the response of the exchange rate to the shock depends on the overall fiscal stance: when the government pursues a contra cyclical primary deficit rule that responds to the public debt, the exchange rate may depreciate, while in an exogenous fiscal rule, it could appreciate.

Moreover, Woodford (2010) used the new Keynesian model of DSGE (Dynamic Stochastic General equilibrium) in order to show analytically how the output multiplier impacted the government purchase, he pursuit to demonstrate the monetary policy

underlying the foregoing analysis has indicated a large effect of increased public spending on output in depression-type circumstances; to some extent, increased government purchases will also increase welfare.

Blanchard and Perotti (2002) handle a VAR model to show the variation of fiscal variables in a period of shocks in the United States. In this paper, Blanchard et al. analyze the dynamic effects of shocks in government spending and taxes on U. S. activity in the postwar period. More precisely, they investigate how output responds to tax and spending shocks in the United States. The main findings suggest when government spending increases, output increases; however, when taxes increase, output falls, and in most cases, the multiplier effect is small and often close to one.

Shen et al. (2015) shows analytically the level of external funding for the government spending effects in Low Income Countries (LIC) increase the government revenues and alleviate the crowding out effects. Through a new Keynesian small economy model, the paper has also shown a change in a domestic financing will affect the consumption and the investment. The capital injected in these economies can appreciate the real exchange rate and reduce the competitiveness of trade in goods in the world. Thus, this effect could be partly offset by a reduction in external trade due to the appreciation of the exchange rate. Secondly, he found the low investment in developing countries have a high return and promote economic growth, however the output multiplier can be smaller than 1. Public investment multipliers are slightly lower in the short run, but much more important in subsequent years as productive public capital accumulates. The adverse effect induced by an increase in public investment is weakened because consumers are waiting for more public spending by the government, which would increase production and future revenues that's why consumption is stronger, crowding out more private investment compared to the effects of an increase in public consumption. Lastly, the author showcases high imports spending in LIC makes public investment inefficient in short run. Higher imports will limit the appreciation of the exchange rate due to foreign aid; on the other hand, it will limit demand for local goods and services.

Berg et al. (2010) use an analytical model of open economy new Keynesian model with two (2) areas to assess the short-term effects of foreign aid financed by fiscal expansion. He makes a distinction between spending the aid controlled by authority of fiscal policy or aid absorption which is used to finance the current deficit through the authority of the Central Bank. This theoretical paper found when the foreign aid represents the principal source of revenues of countries, there does appear to be sufficient on absorbing the resource flow, by opposite when other source of revenues are more important than foreign aid (e.g. export of natural resources or financial services), then level of external financing may use to increase foreign exchange reserves. This situation handles a possible disparity between absorption and government spending, wherein a high increase of external aid can lead to a macroeconomics unbalancing at short run.

Furthermore, from 1970-1999, with a regression analysis in the increasing of government spending for the component of foreign aid for some lower- or middle-income countries, Remmer (2003) has pointed out this fact: the foreign aid increase both private and public consumption as to extent to the investment. The positive impact of foreign aid on government spending can be associated with a revenue raising effort anticipated by the agreement between the different international financial institutions and recipient countries for government to mobilize new tax fields for developing purpose. Rather, the aid claims the growth of public spending and lowering the fiscal effort.

Finally, Feyzioglu et al. (1996) use an aid fungibility model to explain the link between foreign aid and public spending in developing countries. Based on the panel of data used, the main finding highlighted for every dollar spent for grant, there is 0.75 cent will go to the current spending and the other part will go to the capital spending. By analyzing the impact of the concessionary in the different sector (education, transport, communication, infrastructure and health) These authors found the relationship between foreign aid and public spending program in the development field can be a powerful approach to transfer resource to developing country.

In this empirical review, we examine the impact of multiplier spending in Low Income Countries in three (3) ways:

a) How the government spending multiplier impacted the economy of Low-Income Income Countries and the developed countries.
b) Government spending multiplier and the foreign aid and,
c) The impact of government spending in periode of shocks (recession)

The net effect is bigger in developed economy than the developing economy by an increasing of public spending. For the developed country, the economy will benefit 0.66 cent for every dollar spent in this country. By opposite for the LIC, the scenario was even worse, for each dollar spent that cause a decline of GDP of 0.63 cent.

Further, for every dollar spent for grant in developing country, there is 75 cent will go to the current spending and the other part will go to the capital spending. Thereafter, when the foreign aid represents the principal source of revenues of one country, this external fund will absorb the government revenue by reducing the government fiscal effort because the foreign aid will boost the government public spending. In the other side, an important level of external funding will increase the government revenues in Low Income Countries (LIC's), as consequence the exchange rate will appreciate and will affect negatively trade good production. Considering the share of good imports is important in the revenue collected by the LIC's, this situation will reduce the capacity of government to implement some public investment project and will dampen the output multiplier.

Finally, we underline the long-run effects of government spending shocks on the real exchange rate. when the government follows a countercyclical primary-deficit rule that responds to public debt, the exchange rate depreciates, whereas in the case of an exogenous tax rule, it may appreciate. a large effect of an increase of government spending during the crisis period in USA (depression or recession) will increase

government purchases and the welfare. Thus, real exchange rate which may affect national revenues and thus multiplier effect.

This project will try to advance the literature on government spending multiplier through an analysis to identify the factors that make the multiplier effect weak in Low Income Countries (LIC's) and to see how the foreign aid could contribute to the multiplier effect in LIC's in the case of Haiti.

III- METHODOLOGY AND DATA

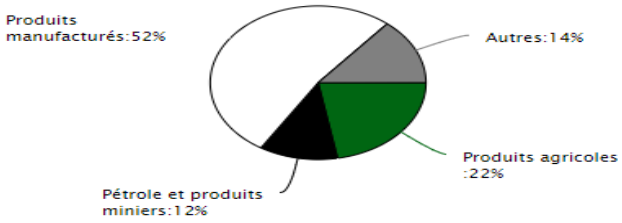
In the first part of this project, we will try to identify analytically the factors which make the multiplier effect of government spending weaker in low income countries. In this section, the database of World Bank, the transparency international and some local data (Haiti data prepared by home institution as ministry of Economy and Finance, Central Bank of Haiti, Haitian Bureau of Statistics and Informatics) were useful to analyze graphically the different factors which make the multiplier effect weaker in Low Income Countries.

In the second part of the document, we will use an input/output matrix of Haiti (2012) and Input/output matrix of South Africa (2014) (Upper Middle-Income Countries) to make some comparisons at certain time.

The 2012 input output table of Haiti was a matrix size 39*22. To convert this table, in a square matrix and to analyze the effect of an increase in each sector, we use the technical made by Araar Abdelkrim and Paolo Verme in the book Price changes and the Input-Output models. This design was developed by the world Bank in Haiti in order to make simulation for the increase of oil product prices in Haiti in 2013.

The set of imports table is missing. According to perspectives mondes, the structure of imports of Haiti is distributed as follow:

Figure 5: Structure Importations of Haiti



Perspective monde, date de consultation: 20/7/2020

We use the structure of imports in Haiti for the year 2015 as coefficient of imports to do an artificial computation in order to find the relevant part of local products in the input output matrix.

share of imports = multiplier * coefficient of imports (see table 11)

Notice: the share of imports is an approximate computation due to the absence of import data in the input-output matrix.

local products= multiplier – share of imports (ref. table 11)

Either A matrix of dimension 21*21 (see matrix A in Appendix) where we found the sector of activities in lines and different branches in columns. This matrix is determined by splitting every cells of the national matrix by the total of its column (technical coefficient), this coefficient indicates the rate at which inputs are converted into outputs. and a matrix B (see matrix B in appendix) for the external demand or imports. Indeed:

$X = AX+B$

$X-AX = AX+B-AX$

$X(I-A) = B$, with $\det (I-A)>0$, (Hawkins Simon condition), in this case we found

$I-A = 0.053>0$, the solution is possible

Hence, $X = B*(I-A)^{-1}$

With $(I-A)^{-1}$ is mathematically the multiplier table or Leontief inverse matrix. With this matrix, we are going to see the induced or indirect effects of an increasing of public spending through the budget support (foreign aid) how this vector will affect the main sectors of the local economy.

For seeing the importance of one sector or the degree of sensibility of these sectors in the economy, we compute the indice of dispersion and sensibility as follows:

$$\textbf{Indice of dispersion} = \frac{\text{each sum of column in inverse matrix coefficient table}}{\text{average value of entire vertical sum in the inverse matrix coefficient table}}$$

$$\textbf{Indice of sensibility} = \frac{\text{each sum of row in inverse matrix coefficient table}}{\text{average value of entire horizontal sum in the inverse matrix coefficient table}}$$

Through a matrix Input output model, we will try to estimate the multiplier effect considering all factors discussed before (corruption, rent seeking, ghost works, Weakness of the local economic structure, and so one). Secondly, if external aids increase local spending, can they have a positive effect on the multiplier, considering all the factors developed in the first part). and lastly, we will try to see if they influence the local production capacity.

In this model, we assume there is a constant return on scale; the prices and technology are fixed during the studied period; there is no constraint supply and the output of sectors are homogenous.

IV- IDENTIFYING THE FACTORS WHICH MAKE THE MULTIPLIER EFFECTS WEAK IN LOW INCOME COUNTRIES (LIC'S)

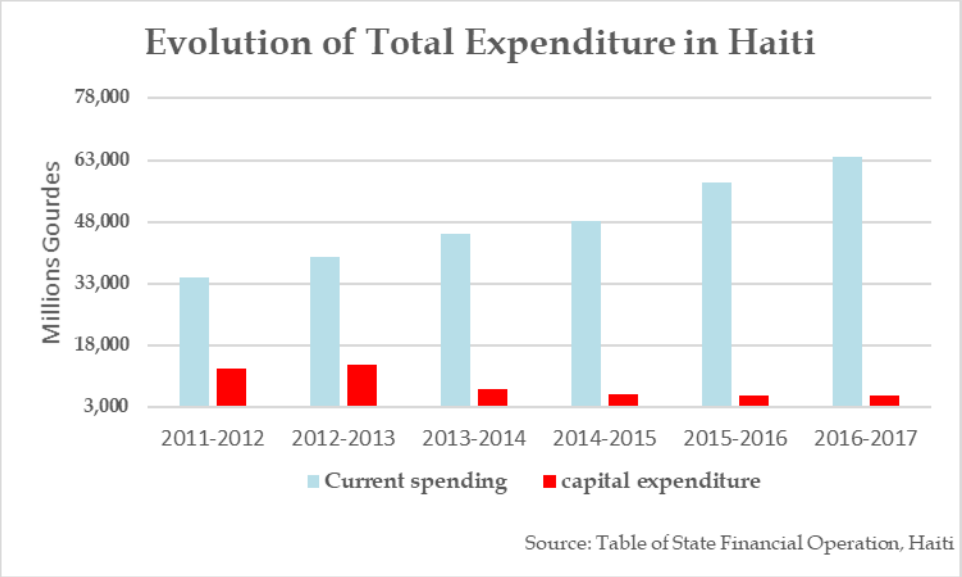
Oslo (1984) identifies two channels through which the government intervenes to increase public spending. Firstly, through investment, the government provides some goods directly to the private sector – such as in education, infrastructure, or indirectly by influencing the allocation of resources to the private sector. As examples of these latter interventions, the government can, for instance, decide to correct market failure and guarantee property rights, or impose some excessive taxes on the private sector even though the excessive burden can distort private incentives. Secondly, the government acts as a producer – meaning that the public sector provides some goods and services in this market. In this channel, if the productivity on public sector is lower than the private sector, Strong government intervention in the economy will impairing key macroeconomic indicators. Nonetheless, if factors productivity is high, government efficiency will boost overall production. The difference in terms of productivity on both sectors (public and private) can originate in the mismanagement of public agencies or the lack of productivity of the public sector.

Further, Emanuele Baldacci et al. (2003) have demonstrated that factors productivity remains the main channel through which the government can transmit fiscal policy towards higher growth in low-income countries. The first channel concerning investment is insensitive to the interest rate or price stability. However, in many low-income countries, this factors productivity is accompanied by the composition of public spending, the quality of public spending (some unproductive government spending, rent seeking, corruption) and weakness of local economic structure. These elements will have some negative effects on growth in these countries.

a) ***Composition of public spending and factor productivity:*** The structure of public spending will always affect factor productivity for any level of the budget deficit. Most of the Low-Income countries, the share of current spending is considerably higher than the capital spending (see figure 4 below). If public employees are involved in bribe-

seeking and rent-seeking activities, a change in the composition of public spending from wage to more productive activities would increase the factor of productivity and thus boost economic growth. However, a cutback of public spending in the area concerning education, health and wages can plug the growth. Also, low levels of public employees wages and mismanagement of public resource can increase corruption. The low level of gain from the wages by the employees of government can create some incentives to find unlawfully other sources of income to compensate some basic needs; As consequence, corruption is likely to increase, leading to a drop in factor productivity and growth. Thus, a reduction in public employees' wages is not always a vector for growth.

Figure 6: EVOLUTION OF PUBLIC SPENDING HAÏTI



As presented in this figure above, the share of capital spending effectively spend during these periods in Haiti varies around 20% against 80% for the current spending. This situation is due to the fact that most of the current spending is devoted on the payment of the salaries because the public sector represents the main employer in this country. When you go a little deeper in the data concerning the current expenditure, we found personel expenditure is the most relevant in this section.

Furthermore, the composition of public expenditure plays an important role in the multiplier effect of public expenditure. If the increase in public expenditure is directed

towards key sectors of the economy, it will be growth-enhancing and capable of generating multiplier effects throughout the productive chain of the economy. Very often, in many low-income countries, these sectors are often neglected and even treated as poor relations.

Table 2: SHARE OF BUDGET BY SECTOR

Share of Total Budget in some relevant sector in Haiti							
Sector	**2011-12**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**Average**
Education	17.5%	14.3%	13.7%	18.4%	17.3%	17.4%	16.4%
Agriculture	11.5%	7.4%	5.8%	6.0%	9.7%	5.7%	7.7%
Health	6.1%	9.1%	5.9%	5.0%	5.4%	4.5%	6.0%
Infrastructure	42.2%	20.0%	17.9%	17.1%	13.1%	15.0%	20.9%
Tourism	0.4%	0.3%	1.4%	0.5%	0.6%	0.6%	0.6%
State University of Haiti	0.5%	0.8%	1.2%	1.1%	1.0%	0.9%	0.9%

Source: National Budget Haiti

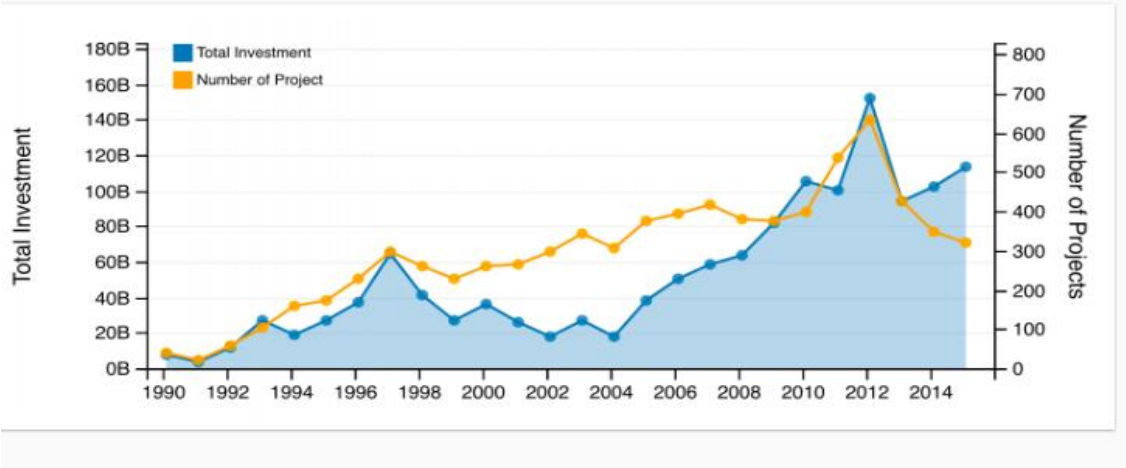
This table presents the share of budget for some vital sectors in the Haitian economy. As display in this summary (table 2), the infrastructure and education sector are the sectors that have spent the most in Haiti's finance laws in recent years. This situation may be due to the reconstruction of public infrastructure and damaged roads after the earthquake of January 12, 2010. On the other hand, these massive investments in the education sector were marked by the appearance of a populist president[1] in May 2011 who wanted to make education his key issue through his PSUGO program (Programme de Scolarisation Universelle Gratuite et Obligatoire). This led to a massive investment in the sector through the distribution of school canteens in schools and the payment of teachers back salaries. However, if you take a closer look at what is going on in this budget, you will see that current expenditure takes up a much larger share than investment expenditure.

On the other hand, an increase in public spending on public infrastructure projects is not automatically favorable for growth. In many low-income countries, corruption tends to reduce efficiency in capital spending. Through corruption, the public call tenders are

[1] *Michel Joseph Martelly*

often imparted by the firms amenable of bribes. Such arrangements contribute to hamper economic performance and the benefits from capital investment.

Figure 7: PUBLIC SPENDING INFRASTRUCTURE IN LIC'S



Source: World Bank data

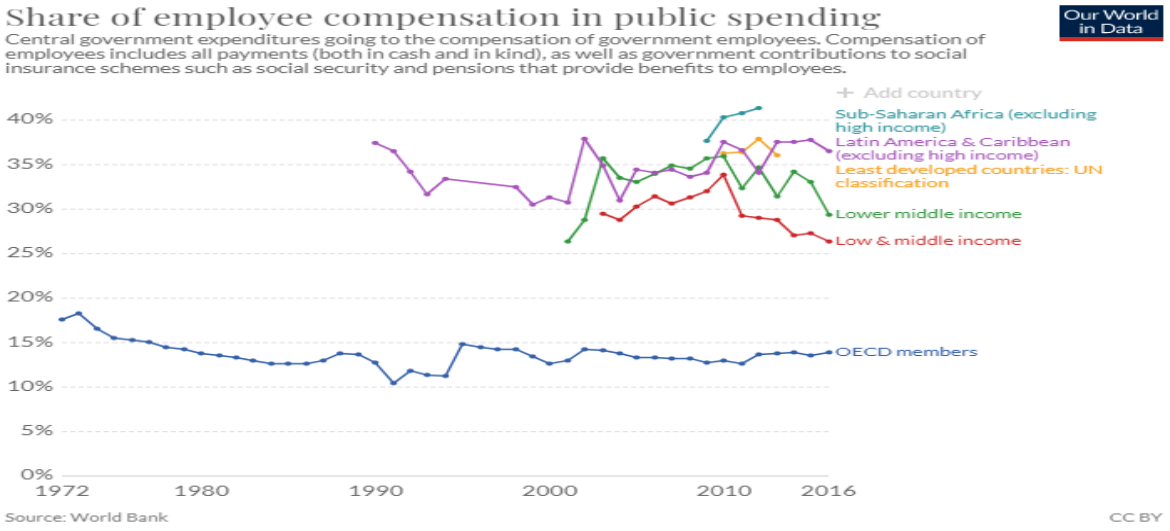
As presented in the figure 5 above, the World Bank use the data across 139 low in middle income to see the evolution of the Public Private Partnership (PPP) in infrastructure aggregating to the project in different sectors like electricity, road and other… From 1990 to 2010, the data marked an increase in the Partnership Public Private. As considering in these countries, the institutions are very weak, it is highly likely these partnerships were developed on political patronage basis, as the tenders were not awarded on a competitive basis.

b) ***Quality of Public spending:*** Several lines of evidence suggest the quality of public spending refer to the arrangement and operation of fiscal policy that support managing macroeconomics objectives in term of fiscal policy, especially in a long-term perspective. This concept is looking to see the effectiveness and the efficiency of public expenditure: In fact, Emanuele Baldacci et al. (2003) and Tock S. Aidt (2016) give some insights through the development of ghost workers, seek bribes and rent seeking in their respective papers.

b.1.- ***Wages for unproductive workers or ghost works:*** In some Low-Income Countries, the public sector remains the leading employer. To cope with

unemployment, poverty and other social factors, the government is compelled to create jobs in the public sector. Those jobs can be both labor-intensive and fictitious employment. For example, a task that can be carried out by one or two employees can be assigned to more than a dozen persons. For fictitious jobs, a person can be appointed to a function, and never shows up at his or her workplace all the while receiving wages from the public administration.

Figure 8: Employment Compensation as a share of Total Public Spending

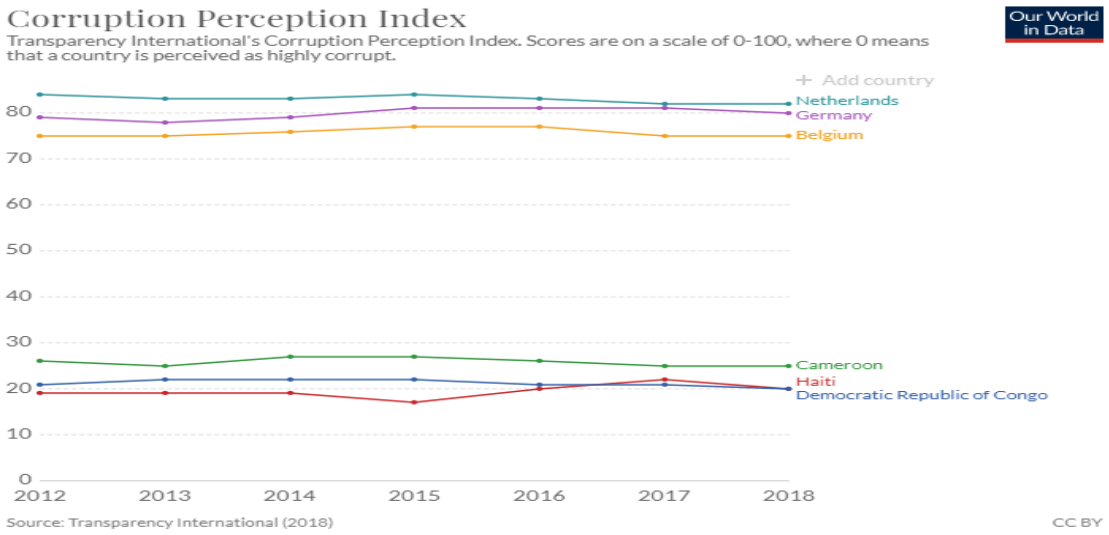


As displayed in Figure 6 above, wages of public servants and other government employees constitute an important share of total public spending in most low and middle-income countries, especially in Sub-Saharan Africa. Throughout OCDE countries, the share of government spending going to the payment of public servants salaries ranges between 10% and 15%. In contrast, throughout most of Sub-Saharan Africa and the least-developed countries, available figures range between 30% and 50% between-countries differences remain very large.

b.2.- Corruption (Seek bribes): Unproductive government spending may take several forms like wages and salaries for unproductive workers or ghost employees. That may also include government expenditure which does not match spending objectives. In addition, unproductive government spending occurs

when officials receive some bribes (corruption) for selecting incompetent firms that carry or execute government projects. Increases in public spending that are driven by corruption have negative effects on growth, and thus generate social losses while exacerbating government inefficiency.

Figure 9: CORRUPTION PERCEPTION INDEX (SEEK BRIBES)



As drawn in this figure 7 above, the developed countries (Germany, Netherlands and Belgium) have a very high score in term of indices of corruption perception that is, an average 80 points by opposite the low income countries like Haiti, Cameroon or Democratic Republic Congo have a lower score, in average 20 points, this mean that the level of corruption is very high in these countries. These weak scores are mainly driven by the public institutions who are heavily compromised based on patronage or nepotism rather than merit.

b.3.- Rent-seeking: Tock S. Aidt (2016) define rent-seeking as a pursuit for privilege benefit from the official of government. Many rents are set up and supported by government policy and government officials and politicians are protectors who handle and who gains access to the rents. When resources for rent-seeking activities are reallocated to productive activities, factor productivity will increase, and thus contributing to higher growth. Rent seeking by the government employment or a specific personal from public spending may not be fully

unsettled by the population. More like, education achievements may require having an employment in the public administration or exercise an influence for the designation of beneficiaries for public spending. This activity (rent-seeking) reduce growth by taking away higher human capital from productive activities. By conclusion, rent seeking has a negative effect on productivity.

Table 3:TAXONOMY OF INFLUENCE OF RENT SEEKING

Table 1 Taxonomy of influence-seeking activities

Means/gains	Gatekeeper does not gain	Gatekeeper gains
(a) General taxonomy		
Income transfer	Impure corruption	Pure corruption
Factor of production	Pure rent seeking	Impure rent seeking
(b) Examples of taxonomy		
Income transfers	Bribes with transaction costs	Bribes with no transaction costs
	Tirole (1992)	Rose-Ackerman (1975)
Factor of production	Advocacy, argumentation	Contestable bribery
	Tullock (1967)	Gradstein and Konrad (1999)

Source: Paper Toke S. Aidt (2016), Rent seeking and the economics of corruption

As presented in the table 3, There is a situation where the holding of the rent activities can gain or does not gain. When the real resource is employed without any gain by the official who assigns it or associated to the transaction cost, the gatekeeper does not gain. However, in other case, where the rent seeking evolves without transaction cost, the gatekeeper will gain. To illustrate, it can be a situation for a firm to benefit a contract from the government to execute a road or other infrastructure project, the official can ask this company to give 15% of the amount of the contract in order to benefit the agreement. To do so, there is a transaction cost associated to the contract, the gatekeeper does not gain. In the other case, where this kind of activity will do without transaction cost, the gatekeeper will gain.

b.4.- Mismanagement of Public Investment: (Keefer and Knack 2007) describe the public investment as a tool to promote the rent seeking and the corruption. In the Country where the institutions are very weak and poor quality of governance, the public investment is often used as a vehicle to increase some illegal activities. For

some countries, where there is political limited check in balance without competitive election, the level of public investment is very high. These investments will affect the growth negatively because these funds will not be used effectively for the project included in the Finance Act. In most developing countries, many large contracts between the government and the private sector are awarded without a call for tenders (direct agreement), depending on the connection between the public authorities and the company in question. This commitment can be linked to the financing of elections or political patronage.

c) ***Weakness of the local economic structure:*** When the government increase the public spending through a raising of salaries of the public sector, this salaries will go to the private consumption where the composition composed exclusively of imported products because the local economy does not produce enough goods and services to support this increase in public expenditure. In this particular case, this increase in civil service wages does not really create a multiplier effect in the national economy. If you consult a matrix input output for low income countries, you will see the import coefficient of all private investment and consumption is very important.

Table 4: Economic data on Haiti and South Africa (2012-2017)

Haiti, Economic data, constant price USD, 2010 basis						
	2012	2013	2014	2015	2016	2017
Imports	4,048,788,150.61	4,178,687,497.50	4,288,811,122.91	4,382,261,100.82	4,419,098,229.04	4,509,640,012.61
GDP	7,190,473,472.45	7,495,898,899.39	7,704,007,550.80	7,798,330,009.30	7,911,617,141.05	8,004,442,565.81
Imports coefficient	56.3%	55.7%	55.7%	56.2%	55.9%	56.3%
Source: World Bank data, computation by the author						

South Africa: Economic data,constant price USD, 2010 basis						
	2012	2013	2014	2015	2016	2017
Imports	119,838,608,097.03	125,847,618,846.64	125,137,336,515.87	131,948,997,432.12	126,854,887,176.97	128,085,559,744.30
GDP	396,257,207,214.54	406,104,993,310.75	413,605,718,439.23	418,543,065,568.06	420,213,420,422.74	426,157,392,310.14
import coefficient	30.2%	31.0%	30.3%	31.5%	30.2%	30.1%
Source: World Bank data, computation by the Author						

As presented in this table 4, the import coefficient in Haiti is very high in comparison with the import coefficient of South Africa (***Upper Middle country)***. From 2012 to 2017, the average import coefficient has increased to 56% against 31% in South Africa, which could explain the weaker impact of increasing demand on local demand. Therefore, any increase in public spending on salaries for example, will allow households to increase their consumption, and since the economic base of the country is very weak, this final consumption will be partly devoted to the consumption of imported products, reducing the multiplier effect on the economy.

In summary, public spending multiplier in low-Income Countries is partly drained by structure of public spending or factor productivity, the quality of public spending (corruption, rent seeking, unproductive works in the public sector, mismanagement of public investment) and the weakness of local economy structure. These different elements are prone to induce a weaker impact on growth in developing countries (***view figure 10 Nutshell Channel below)***.

Figure 10: Nutshell Channel Multiplier Effect in LIC's

Source: Muller ISAAC

V- HOW THE FOREIGN AID COULD CONTRIBUTE TO THE MULTIPLIER EFFECT IN LIC'S (CASE OF HAITI)

A- Analyze Matrix Input/output

Haiti like other Low-Income Countries (LIC) has an agriculture-based economy where the farming sector occupied a large part in the economy[2]. This evidence will appear in the output of the Leontief model (input/output matrix)[3] where the net effect will be more relevant for the good produced in the agriculture sector than the other sector.

For the year 2012, for every additional gourde[4] (1 gourde) involved in the agriculture, manufacture of food products, manufacture of tobacco and cigarettes, manufacture of textiles that change will ultimately increase respectively the production of local economy by 1.76 gourde, 2.56 gourdes, 2.21 gourdes and 2.11 gourdes in outputs.

After subtraction of the imports, we see for every additional currency (1 gourde) involved in the agriculture, manufacture of food products, manufacture of tobacco and cigarettes, manufacture of clothes that change will ultimately increase respectively the production of local economy by 1.38 gourde, 1.23, 1.06 gourde and 1.01 gourde in outputs.

In a nutshell, we suppose the share of imports of local goods products and the factors can make weaker the output multiplier are distributed as follow: manufactured goods, agricultural products, oil and mining products and Others represent respectively 52%, 22%, 12% and 14% of the total of imports goods, we can conclude for any additional revenue (one gourde) injected in the economy that will increase the production of every sector in the local economy by 1.20 gourde in average.

To go even further in our analyses, we will try to look at the direct and indirect effects of the apport for this additional aid in the various sectors in the economy to see how local

[2] Agriculture 22%, Industry 20%, and Services 58% (IHSI HAITI, 2015)
[3] evidence in the table 5
[4] Unit currency of Haiti

production and employment have been affected by this contribution or what is the net effect of this additional revenue of the Haitian economy.

B- Direct and indirect effects.

Table 5: Table of Final demand

Products	Final demand
Agriculture, Sylviculture, Elevage, Chasse, Peche	72,839,057.78
Industries Extractives	4,287,567.58
Electricite , gaz et eau	6,125,378.12
Fabrication des produits alimentaires et boissons	43,380,285.17
Fabrication de Tabac et cigarretes	584,679.42
Fabrication des textiles d'habillement et cuirs	49,446,408.89
Fabrication des articles et ouvrages en bois	6,820,863.19
Fabrication papier, de carton; imprimerie	16,034,446.15
Fabrication produits chimiques, d'articles en caoutchou ou en matières plastiques	27,810,489.37
Fabrication de produits mineraux non-metalique	22,400,053.70
Ouvrages en metaux nca	2,245,770.68
Fabrication d'ouvrages metalurgiques	8,730,800.71
Fabrication de matériels et d'équipements électriques	7,997,959.06
Construction	36,211,484.94
Commerce	-
Hôtels et restaurants	136,095.61
Trasnports et communications	29,410,328.63
Intermédiation financière	39,884,995.68
Autres services, marchands	6,745,271.14
Autres services non marchands	733,582.52
Produits de cokerie; pétroliers raffinés	6,535,994.95
Source: computation by the Author, from Table X= (I-A)^-1 *Y	

To analyze the direct impact of any additional local currency injected in the economy, we follow the same methodology made by the Federal Planning bureau Economic analysis and forecast in Belgium in the document Multiplier user's guide[5] (pp. 5-6) where we compute the output from the inverse Leontief matrix.

[5] https://www.plan.be/databases/mult2010_sec2010/multiplicateurs_2010_esa2010_en.pdf

An increase of 1 gourde in demand for agricultural product, that will increase the production of local economy by 1,38 gourdes. For this particular sector, the output multiplier is 100.5 million gourdes (72.8 * 1.38).

The direct impact of an increase in the clothes sector will be a requirement to increase the total output in the manufacturing of clothes in order to satisfy the final demand. an increase of one gourde in demand in clothes sector will increase the production of local economy by 1.01 gourde. For this particular sector, the output multiplier is 49.89 million gourdes (49.4 * 1.01).

The direct impact of an increase of food manufacturing will be a requirement to increase the total output in the manufacturing of food in order to satisfy the final demand. An increase of one gourde in demand for food manufacturing that will increase the production by local economy by 1.23 gourde. For this particular sector, the output multiplier is 53.38 million gourdes (43.4* 1.23).

By referring to the Leontief Matrix inverse each component presents the total contribution required (direct, indirect, and induced) from the sector's per gourde of output produced by the sector in column. As there are many sectors to analyze in this project, I will put my focus on the agricultural sector.

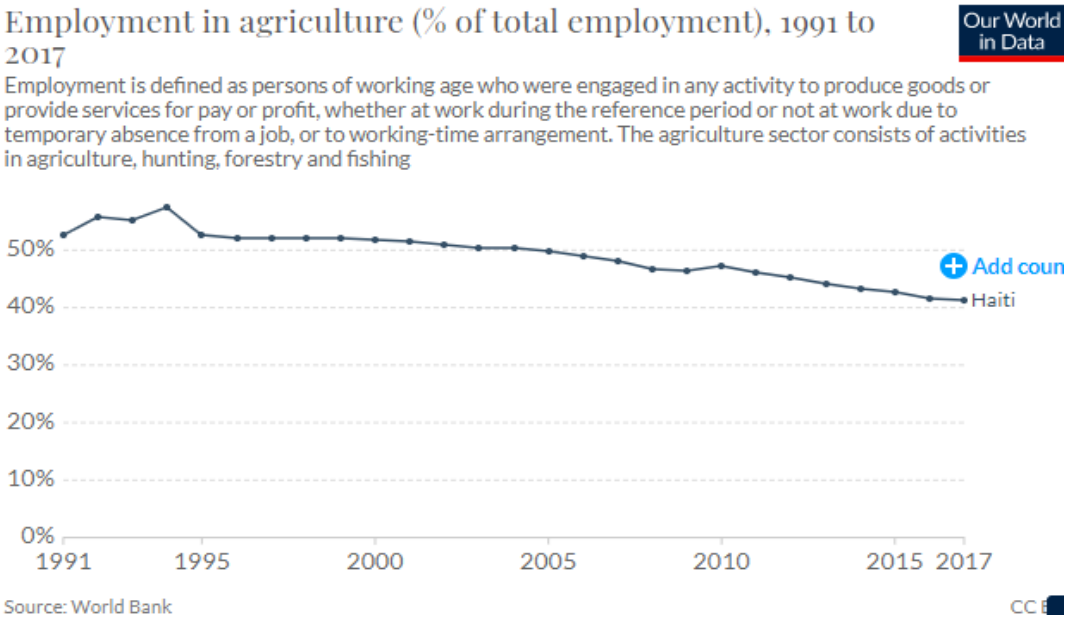
B- Impact on employment/ Employment multiplier

According to the World Bank, the active population of Haiti is evaluated around 4.3 million people. For the year 2012, the labor force in agriculture represent 45.12% (see table below). That's mean there is 1.9 million people working on this area.

Referring to the user guide on multiplier[6] (pp. 5-6) made by the Federal Planning bureau Economic analysis and forecast in Belgium and the World Bank data concerning the agriculture employment:

[6] https://www.plan.be/databases/mult2010_sec2010/multiplicateurs_2010_esa2010_en.pdf

Figure 11: Employment Agriculture Haiti



We assume the labor productivity is constant over year

Thus, the employment multiplier in the agriculture sector will be:

employment multiplier = 1.9 million * 1.38 = 2.62 million.

to know the level of employment effectively create in this sector, we will make the difference between the new and old jobs. Jobs created= 2.62 - 1.9 = 0.722 million. In other words, there is 722 additional (direct and indirect) jobs in this industry that are part of the supply chain of the agriculture.

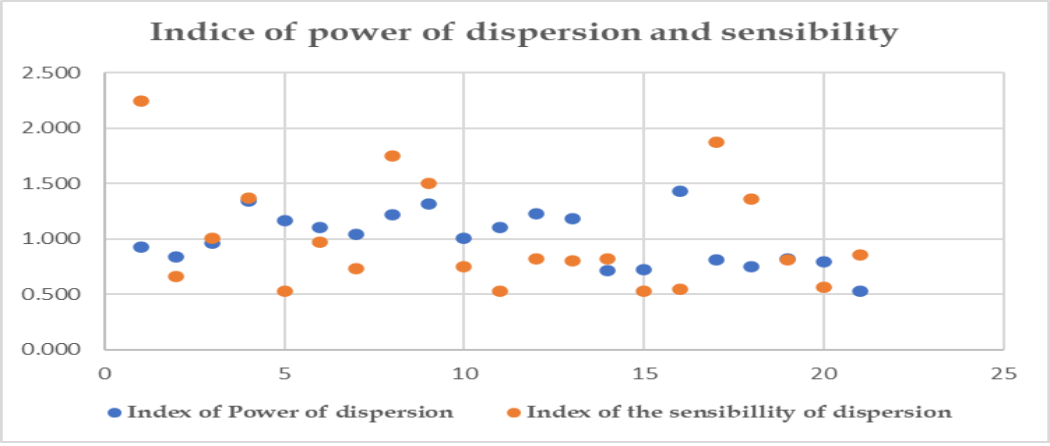
C- Index of the Power of Dispersion and Index of the Sensitivity of Dispersion

Table 6: Indice of Power of dispersion and sensibility

Indice of power of dispersion and sensibility		
Products	**Index of Power of dispersion**	**Index of the sensibillity of dispersion**
Agriculture, Sylviculture, Elevage, Chasse, Peche	0.924	2.242
Industries Extractives	0.838	0.659
Electricite , gaz et eau	0.961	1.010
Fabrication des produits alimentaires et boissons	1.341	1.371
Fabrication de Tabac et cigarretes	1.161	0.524
Fabrication des textiles d'habillement et cuirs	1.104	0.971
Fabrication des articles et ouvrages en bois	1.042	0.728
Fabrication papier, de carton; imprimerie	1.217	1.750
Fabrication produits chimiques, d'articles en caoutchou ou en matières plastiques	1.314	1.499
Fabrication de produits mineraux non-metalique	1.008	0.751
Ouvrages en metaux nca	1.103	0.524
Fabrication d'ouvrages metalurgiques	1.231	0.816
Fabrication de matériels et d'équipements électriques	1.180	0.801
Construction	0.718	0.822
Commerce	0.724	0.524
Hôtels et restaurants	1.430	0.551
Trasnports et communications	0.816	1.870
Intermédiation financière	0.751	1.359
Autres services, marchands	0.819	0.808
Autres services non marchands	0.793	0.566
Produits de cokerie; pétroliers raffinés	0.524	0.852

Source: Matrix Input Output Haiti 2012, computation by the Author

Figure 12: Indice of power of dispersion and sensibility



This table above shows us the index of power dispersion and the sensibility of dispersion in the input output table. For the dispersion, it allows us to demonstrate the relative

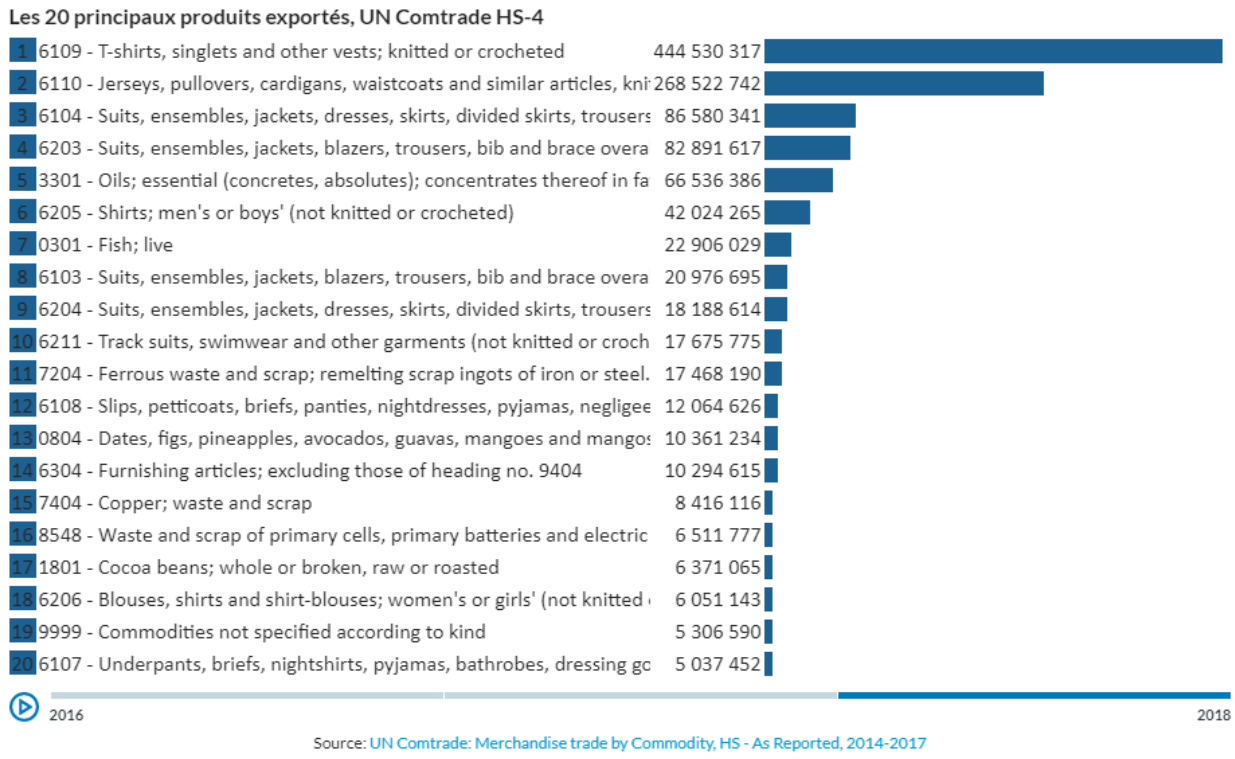
impact of production in one particular sector on output in the economy as whole. As presented in the table above, we found the sector and Hotel & restaurant and tobaccos and cigarette manufacturing are the highest power of dispersion i.e. both sectors can carry out a great repercussion on the entire industry. This situation is quite relevant because the tourism sector occupied an important part of the economy and on the other hand the tobaccos and cigarette manufacturing **(Compagnie Des Tabacs Comme Il Faut S.A)**[7] represent one of the best taxpayers in the economy for the last five (5) years.

In the other side, the sensibility of dispersion shows how the variation in a final demand of good can impacted the entire production. Once time the sensibility of particular sector is high that's mean this sector provide a lot of inputs in the production of some goods in the economy. Thus, the agriculture sector holds the highest sensibility ***(sensibility agriculture is 2.24)*** that's mean any variation in this sector may affect the output of the local economy negatively or subsequently. In spite of we practice traditional agriculture, the agricultural sector is a transversal sector of the Haitian economy. Any dysfunction in this sector will affect the output. Moreover, Haiti's main exports are mainly textiles (e.g.

[7] https://lenouvelliste.com/article/194065/les-200-plus-grands-contribuables-pour-lexercice-2017-2018

T-shirts, pullovers, suits, suits), essential oils and fruits such as mangoes and pineapples (see figure 12 below).

Figure 13:Table of exportation Products Haiti 2014-2017



VI- CONCLUSION

This economic paper tries to demonstrate the government spending multiplier in Low Income Countries. At the beginning, we have identified the relevant factors make the multiplier weak in the developing countries such as composition of public spending and productivity factor, the quality of public spending, weaknesses of the local economic structure are the main elements causing some damages to the multiplier in emerging countries.

Subsequently, we analyze how any additional revenue (foreign aid) in the economy can benefit for the economy. We found there is a positive effect in the economy in the overall branches for every additional local currency (1 gourde) involved in the economy that change will ultimately increase in average the production of local economy by 1.20 gourde in outputs respectively for all branches in the economy (agriculture, extractive industry, trade, construction, manufacture of food products and beverages, and so one…) more details in the appendix (see table 11).

Finally, we found the sector Hotel & restaurant and tobaccos & cigarette manufacturing have the highest dispersion in the economy; any disturbances in these particular sectors can have a great repercussion in the economy. In the other side, the agriculture remains the main sector in the economy; any variation in this sector will affect the output because the degree of sensibility of this sector is very high.

Table 7: Table Input/Output

Table Input-Output																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Categories d'Entrees / Categories de Sorties	Agriculture, Sylviculture, Elevage, Chasse, Peche	Industries Extractives	Electricite , gaz et eau	Fabrication des produits alimentaires et boissons	Fabrication de Tabac et cigarretes	Fabrication des textiles d'habillement et cuirs	Fabrication des articles et ouvrages en bois	Fabrication papier, de carton; imprimerie	Fabrication produits chimiques, d'articles en caoutchou ou en matières plastiques	Fabrication de produits mineraux non-metalique	Ouvrages en metaux nca	Fabrication d'ouvrages metalurgiques	Fabrication de matériels et d'équipements électriques	Construction	Commerce	Hôtels et restaurants	Trasnports et communications	Intermédiation financière	Autres services, marchands	Autres services non, marchands	Produits de cokerie; pétroliers raffinés
Agriculture, Sylviculture, Elevage, Chasse, Peche	33257	42	0	4802	113	3770	1096	0	203	0	0	0	0	6618	0	488	0	0	0	10	0
Industries Extractives	0	0	0	13	0	0	0	0	0	572	0	0	0	1043	0	2	0	0	0	0	0
Electricite , gaz et eau	130	2	81	184	48	292	76	204	51	155	23	216	164	642	423	54	693	69	429	156	0
Fabrication des produits alimentaires et boissons	2135	0	0	9162	0	0	0	0	0	0	0	0	0	0	0	2549	0	0	0	51	0
Fabrication de Tabac et cigarretes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabrication des textiles d'habillement et cuirs	136	0	96	35	0	8269	24	31	9	29	3	44	0	109	0	60	0	7	458	251	0
Fabrication des articles et ouvrages en bois	0	0	0	2143	5	0	0	0	0	0	0	0	0	0	0	102	0	0	820	666	0
Fabrication papier, de carton; imprimerie	39	17	118	641	52	307	178	2290	184	87	5	107	206	168	252	25	230	105	149	87	0
Fabrication produits chimiques, d'articles en caoutchou ou en matières plastiques	3643	0	38	89	3	16	3	10	1149	36	94	8	965	42	3321	1	1288	5	99	202	0
Fabrication de produits mineraux non-metalique	192	0	325	68	0	0	0	0	0	501	3	0	0	6890	0	0	625	0	269	51	0
Ouvrages en metaux nca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabrication d'ouvrages metalurgiques	0	0	0	0	0	0	0	0	0	0	16	173	1460	2540	0	0	0	0	0	0	0
Fabrication de matériels et d'équipements électriques	50	0	0	0	0	0	0	0	0	0	25	0	262	0	0	0	9131	0	1	1	0
Construction	1515	0	2280	8	0	4	1	49	15	165	8	8	112	0	123	10	40	43	319	95	0
Commerce	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hôtels et restaurants	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	0	57	18	69	382	0
Trasnports et communications	4683	24	4145	275	17	507	145	282	123	61	43	120	1179	1663	12684	38	2195	1526	2967	234	0
Intermédiation financière	132	260	777	100	40	150	95	97	105	39	40	83	612	771	540	32	3793	1075	311	479	0
Autres services, marchands	1439	29	27	13	11	83	31	56	12	49	13	121	6	153	10029	7	242	177	156	35	0
Autres services non marchands	360	0	3	12	0	19	11	23	5	4	0	2	4	76	161	3	102	32	201	0	0
Produits de cokerie; pétroliers raffinés	134	41	257	30	2	12	11	30	18	170	5	26	143	245	30	34	5865	87	206	206	0
VALEUR AJOUTEE BRUTE	65927	611	6657	7522	144	10549	1351	1905	903	1542	225	352	3075	83841	93901	1247	51754	8011	12966	7979	1
PRODUCTION DE BIENS ET SERVICES	113772	1026	14804	25097	435	23978	3022	4977	2777	3411	502	1260	8188	104801	121496	4652	76015	11155	19420	10884	1

Table 8: Matrix Input/output (A)

Technical coefficient Matrix: A	Agriculture, Sylviculture, Elevage, Chasse, Peche	Industries Extractives	Electricite , gaz et eau	Fabrication des produits alimentaires et boissons	Fabrication de Tabac et cigarretes	Fabrication des textiles d'habillement et cuirs	Fabrication des articles et ouvrages en bois	Fabrication papier, de carton; imprimerie	Fabrication produits chimiques, d'articles en caoutchou ou en matières plastiques	Fabrication de produits mineraux non-metalique	Ouvrages en metaux nca	Fabrication d'ouvrages metalurgiques	Fabrication de matériels et d'équipements électriques	Construction	Commerce	Hôtels et restaurants	Trasnports et communications	Intermédiation financière	Autres services, marchands	Autres services non, marchands	Autres services non, marchands
Agriculture, Sylviculture, Elevage, Chasse, Peche	-0.669	0.067	0.000	0.469	0.781	0.224	0.773	0.000	0.218	0.000	0.000	0.000	0.000	-0.155	0.000	0.374	0.000	0.000	0.000	0.001	0.000
Industries Extractives	0.000	0.000	0.000	-0.088	0.000	0.000	0.000	0.000	0.000	-3.566	0.000	0.000	0.000	-7.162	0.000	-0.012	0.000	0.000	0.000	0.000	0.000
Electricite , gaz et eau	0.002	0.003	0.012	0.024	0.333	0.028	0.056	0.107	0.056	0.101	0.101	0.614	0.053	0.008	0.005	0.043	0.013	0.009	0.033	0.020	0.000
Fabrication des produits alimentaires et boissons	-0.049	0.000	0.000	0.867	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.946	0.000	0.000	0.000	0.004	0.000
Fabrication de Tabac et cigarretes	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fabrication des textiles d'habillement et cuirs	-0.002	0.000	0.011	0.004	0.000	0.519	0.017	0.015	0.010	0.018	0.014	0.124	0.000	-0.002	0.000	0.046	0.000	0.001	0.021	0.023	0.000
Fabrication des articles et ouvrages en bois	0.000	0.000	0.000	-0.487	0.033	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.045	0.000	0.000	-0.232	-0.156	0.000
Fabrication papier, de carton; imprimerie	-0.016	0.021	-0.033	-0.189	0.339	-0.102	0.056	0.223	0.125	0.019	0.021	0.258	-0.021	-0.070	-0.105	0.009	-0.094	-0.032	-0.052	-0.026	0.000
Fabrication produits chimiques, d'articles en caoutchou ou en matières plastiques	-0.262	0.000	0.002	0.004	0.021	0.000	0.002	0.004	1.172	0.020	0.408	0.022	0.230	-0.003	-0.254	0.001	-0.087	0.000	-0.001	0.008	0.000
Fabrication de produits mineraux non-metalique	-0.009	0.000	0.029	0.005	0.000	0.000	0.000	0.000	0.000	0.293	0.014	0.000	0.000	-0.348	0.000	0.000	-0.027	0.000	0.004	0.003	0.000
Ouvrages en metaux nca	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fabrication d'ouvrages metalurgiques	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.069	0.458	0.192	-0.462	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fabrication de matériels et d'équipements électriques	-0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.104	0.000	0.021	0.000	0.000	0.000	-2.069	0.000	0.000	0.000	0.000
Construction	-0.024	0.000	0.272	0.001	0.000	0.000	0.001	0.024	0.016	0.102	0.034	0.022	0.033	0.000	-0.002	0.008	0.000	0.004	0.015	0.009	0.000
Commerce	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hôtels et restaurants	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.005	0.048	0.000
Trasnports et communications	-0.393	0.037	0.212	0.009	0.116	-0.002	0.093	0.120	0.124	0.034	0.185	0.329	0.266	-0.145	-1.123	0.027	-0.175	0.039	-0.065	0.006	0.000
Intermédiation financière	-0.003	0.417	0.090	0.010	0.276	0.009	0.067	0.048	0.113	0.024	0.178	0.233	0.178	-0.017	-0.013	0.025	-0.058	0.097	0.013	0.044	0.000
Autres services, marchands	-0.449	0.038	-0.005	-0.003	0.073	-0.019	0.013	0.011	0.009	0.016	0.054	0.304	0.000	-0.048	-3.177	0.003	-0.075	-0.036	-0.039	-0.007	0.000
Autres services non marchands	0.005	0.000	0.000	0.002	0.000	0.002	0.008	0.012	0.006	0.002	0.001	0.006	0.001	0.001	0.002	0.002	0.002	0.004	0.016	0.000	0.000
Produits de cokerie; pétroliers raffinés	-0.083	0.041	-0.124	-0.015	0.013	-0.006	0.001	-0.003	0.009	0.003	0.018	0.057	-0.044	-0.152	-0.019	0.006	-3.598	-0.044	-0.114	-0.104	0.000
VALEUR AJOUTEE BRUTE	0.579	0.596	0.450	0.300	0.331	0.440	0.447	0.383	0.325	0.452	0.448	0.279	0.376	0.800	0.773	0.268	0.681	0.718	0.668	0.733	1.000
PRODUCTION DE BIENS ET SERVICES	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Table 9: Identify Matrix

Identity Matrix: I																					
Categories d'Entrees / Categories de Sorties	Agriculture, Sylviculture, Elevage, Chasse, Peche	Industries Extractives	Electricite , gaz et eau	Fabrication des produits alimentaires et boissons	Fabrication de Tabac et cigarretes	Fabrication des textiles d'habillement et cuirs	Fabrication des articles et ouvrages en bois	Fabrication papier, de carton; imprimerie	Fabrication produits chimiques, d'articles en caoutchou ou en matières plastiques	Fabrication de produits mineraux non-metalique	Ouvrages en metaux nca	Fabrication d'ouvrages metalurgiques	Fabrication de matériels et d'équipements électriques	Construction	Commerce	Hôtels et restaurants	Trasnports et communications	Intermédiation financière	Autres services, marchands	Autres services non, marchands	Produits de cokerie; pétroliers raffinés
Agriculture, Sylviculture, Elevage, Chasse, Peche	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industries Extractives	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electricite , gaz et eau	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabrication des produits alimentaires et boissons	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabrication de Tabac et cigarretes	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabrication des textiles d'habillement et cuirs	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabrication des articles et ouvrages en bois	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabrication papier, de carton; imprimerie	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabrication produits chimiques, d'articles en caoutchou ou en matières plastiques	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Fabrication de produits mineraux non-metalique	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Ouvrages en metaux nca	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Fabrication d'ouvrages metalurgiques	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Fabrication de matériels et d'équipements électriques	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Commerce	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Hôtels et restaurants	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Trasnports et communications	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Intermédiation financière	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Autres services, marchands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Autres services non marchands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Produits de cokerie; pétroliers raffinés	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Table 10: Matrix I-A

Determine the inverse matrix of Leontief (I-A)^-1 : For now determine I-A

Categories d'Entrees / Categories de Sorties	Agriculture, Sylviculture, Elevage, Chasse, Peche	Industries Extractives	Electricite , gaz et eau	Fabrication des produits alimentaires et boissons	Fabrication de Tabac et cigarretes	Fabrication des textiles d'habillement et cuirs	Fabrication des articles et ouvrages en bois	Fabrication papier, de carton; imprimerie	Fabrication produits chimiques, d'articles en caoutchou ou en matières plastiques	Fabrication de produits minéraux non-metalique	Ouvrages en metaux nca	Fabrication d'ouvrages metalurgiques	Fabrication de materiels et d'equipements électriques	Construction	Commerce	Hôtels et restaurants	Trasnports et communications	Intermédiation financière	Autres services, marchands	Autres services non, marchands	Produits de cokerie; pétroliers raffinés
Agriculture, Sylviculture, Elevage, Chasse, Peche	0.7077	-0.0409	0.0000	-0.1913	-0.2598	-0.1572	-0.3627	0.0000	-0.0731	0.0000	0.0000	0.0000	0.0000	-0.0631	0.0000	-0.1049	0.0000	0.0000	0.0000	-0.0009	0.0000
Industries Extractives	0.0000	1.0000	0.0000	-0.0005	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1678	0.0000	0.0000	0.0000	-0.0100	0.0000	-0.0004	0.0000	0.0000	0.0000	0.0000	0.0000
Electricite , gaz et eau	-0.0011	-0.0019	0.9945	-0.0073	-0.1103	-0.0122	-0.0251	-0.0410	-0.0184	-0.0455	-0.0454	-0.1714	-0.0200	-0.0061	-0.0035	-0.0116	-0.0091	-0.0062	-0.0221	-0.0144	0.0000
Fabrication des produits alimentaires et boissons	-0.0188	0.0000	0.0000	0.6349	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.5479	0.0000	0.0000	0.0000	-0.0047	0.0000
Fabrication de Tabac et cigarretes	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Fabrication des textiles d'habillement et cuirs	-0.0012	0.0000	-0.0065	-0.0014	0.0000	0.6551	-0.0079	-0.0062	-0.0032	-0.0086	-0.0064	-0.0349	0.0000	-0.0010	0.0000	-0.0129	0.0000	-0.0006	-0.0236	-0.0231	0.0000
Fabrication des articles et ouvrages en bois	0.0000	0.0000	0.0000	-0.0854	-0.0115	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0219	0.0000	0.0000	-0.0422	-0.0611	0.0000
Fabrication papier, de carton; imprimerie	-0.0003	-0.0166	-0.0080	-0.0255	-0.1195	-0.0128	-0.0589	0.5399	-0.0663	-0.0255	-0.0103	-0.0849	-0.0252	-0.0016	-0.0021	-0.0054	-0.0030	-0.0094	-0.0077	-0.0080	0.0000
Fabrication produits chimiques, d'articles en caoutchou ou en matières plastiques	-0.0320	0.0000	-0.0026	-0.0035	-0.0069	-0.0007	-0.0010	-0.0020	0.5862	-0.0104	-0.1865	-0.0063	-0.1179	-0.0004	-0.0273	-0.0002	-0.0169	-0.0004	-0.0051	-0.0185	0.0000
Fabrication de produits minéraux non-metalique	-0.0017	0.0000	-0.0220	-0.0027	0.0000	0.0000	0.0000	0.0000	0.0000	0.8532	-0.0061	0.0000	0.0000	-0.0657	0.0000	0.0000	-0.0082	0.0000	-0.0139	-0.0047	0.0000
Ouvrages en metaux nca	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Fabrication d'ouvrages metalurgiques	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0322	0.8627	-0.1783	-0.0242	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Fabrication de matériels et d'équipements électriques	-0.0004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0491	0.0000	0.9680	0.0000	0.0000	0.0000	-0.1201	0.0000	-0.0001	-0.0001	0.0000
Construction	-0.0133	0.0000	-0.1540	-0.0003	0.0000	-0.0002	-0.0003	-0.0098	-0.0054	-0.0483	-0.0155	-0.0063	-0.0137	1.0000	-0.0010	-0.0021	-0.0005	-0.0039	-0.0164	-0.0088	0.0000
Commerce	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hôtels et restaurants	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0003	1.0000	-0.0007	-0.0016	-0.0036	-0.0351	0.0000
Trasnports et communications	-0.0412	-0.0234	-0.2800	-0.0110	-0.0391	-0.0211	-0.0480	-0.0567	-0.0443	-0.0180	-0.0847	-0.0952	-0.1440	-0.0159	-0.1044	-0.0082	0.9711	-0.1368	-0.1528	-0.0215	0.0000
Intermédiation financière	-0.0012	-0.2534	-0.0525	-0.0040	-0.0920	-0.0063	-0.0314	-0.0195	-0.0378	-0.0115	-0.0802	-0.0659	-0.0747	-0.0074	-0.0044	-0.0069	-0.0499	0.9036	-0.0160	-0.0440	0.0000
Autres services, marchands	-0.0126	-0.0283	-0.0018	-0.0005	-0.0253	-0.0035	-0.0103	-0.0113	-0.0043	-0.0143	-0.0259	-0.0960	-0.0007	-0.0015	-0.0825	-0.0015	-0.0032	-0.0159	0.9920	-0.0032	0.0000
Autres services non marchands	-0.0032	0.0000	-0.0002	-0.0005	0.0000	-0.0008	-0.0036	-0.0046	-0.0018	-0.0011	-0.0006	-0.0016	-0.0005	-0.0007	-0.0013	-0.0006	-0.0013	-0.0029	-0.0104	1.0000	0.0000
Produits de cokerie; pétroliers raffinés	-0.0012	-0.0400	-0.0174	-0.0012	-0.0046	-0.0005	-0.0036	-0.0060	-0.0065	-0.0500	-0.0093	-0.0206	-0.0175	-0.0023	-0.0002	-0.0073	-0.0772	-0.0078	-0.0106	-0.0189	1.0000

Table 11: Inverse Matrix $(I-A)^{-1}$

Categories d'Entrees / Categories de Sorties	Agriculture, Sylviculture, Elevage, Chasse, Peche	Industries Extractives	Electricite , gaz et eau	Fabrication des produits alimentaires et boissons	Fabrication de Tabac et cigarretes	Fabrication des textiles d'habillement et cuirs	Fabrication des articles et ouvrages en bois	Fabrication papier, de carton; imprimerie	Fabrication produits chimiques, d'articles en caoutchou ou en matières plastiques	Fabrication de produits mineraux non-metalique	Ouvrages en metaux nca	Fabrication d'ouvrages metalurgiques	Fabrication de matériels et d'équipements électriques	Construction	Commerce	Hôtels et restaurants	Trasnports et communications	Intermédiation financière	Autres services, marchands	Autres services non, marchands	Produits de cokerie; pétroliers raffinés
Agriculture, Sylviculture, Elevage, Chasse, Peche	1.439	0.061	0.021	0.507	0.386	0.347	0.527	0.010	0.185	0.026	0.044	0.027	0.031	0.095	0.009	0.446	0.008	0.004	0.038	0.065	0.000
Industries Extractives	0.001	1.000	0.009	0.002	0.002	0.001	0.001	0.001	0.001	0.199	0.003	0.003	0.002	0.023	0.001	0.002	0.002	0.001	0.004	0.002	0.000
Electricite , gaz et eau	0.007	0.008	1.017	0.023	0.127	0.023	0.035	0.081	0.045	0.061	0.070	0.218	0.073	0.017	0.010	0.027	0.021	0.012	0.030	0.021	0.000
Fabrication des produits alimentaires et boissons	0.043	0.002	0.001	1.590	0.012	0.010	0.016	0.001	0.006	0.001	0.002	0.002	0.001	0.003	0.001	0.876	0.001	0.002	0.005	0.040	0.000
Fabrication de Tabac et cigarretes	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fabrication des textiles d'habillement et cuirs	0.005	0.002	0.012	0.008	0.007	1.528	0.016	0.020	0.013	0.018	0.018	0.071	0.016	0.005	0.004	0.025	0.003	0.003	0.039	0.038	0.000
Fabrication des articles et ouvrages en bois	0.005	0.002	0.000	0.136	0.014	0.002	1.003	0.002	0.001	0.001	0.002	0.006	0.002	0.001	0.004	0.097	0.001	0.001	0.044	0.066	0.000
Fabrication papier, de carton; imprimerie	0.016	0.039	0.028	0.098	0.237	0.042	0.119	1.861	0.217	0.070	0.079	0.200	0.118	0.015	0.015	0.070	0.027	0.025	0.029	0.033	0.000
Fabrication produits chimiques, d'articles en caoutchou ou en matières plastiques	0.084	0.008	0.024	0.042	0.043	0.025	0.037	0.016	1.724	0.027	0.342	0.030	0.226	0.010	0.055	0.034	0.059	0.011	0.022	0.039	0.000
Fabrication de produits mineraux non-metalique	0.006	0.002	0.042	0.008	0.008	0.003	0.005	0.006	0.005	1.180	0.014	0.014	0.007	0.079	0.003	0.006	0.012	0.003	0.021	0.008	0.000
Ouvrages en metaux nca	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fabrication d'ouvrages metalurgiques	0.003	0.002	0.013	0.002	0.004	0.002	0.003	0.005	0.004	0.004	0.053	1.167	0.221	0.029	0.004	0.002	0.028	0.005	0.005	0.002	0.000
Fabrication de matériels et d'équipements électriques	0.010	0.010	0.040	0.009	0.017	0.008	0.013	0.019	0.016	0.009	0.072	0.029	1.063	0.005	0.017	0.008	0.133	0.021	0.023	0.006	0.000
Construction	0.022	0.004	0.161	0.013	0.029	0.010	0.015	0.032	0.022	0.069	0.033	0.047	0.031	1.008	0.005	0.014	0.008	0.007	0.024	0.014	0.000
Commerce	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
Hôtels et restaurants	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.001	0.000	0.001	1.000	0.001	0.002	0.004	0.035	0.000
Trasnports et communications	0.076	0.080	0.321	0.068	0.138	0.065	0.104	0.150	0.131	0.070	0.171	0.235	0.244	0.037	0.134	0.063	1.076	0.170	0.186	0.051	0.000
Intermédiation financière	0.013	0.289	0.087	0.024	0.128	0.019	0.050	0.058	0.090	0.083	0.130	0.123	0.135	0.022	0.019	0.026	0.078	1.121	0.038	0.060	0.000
Autres services, marchands	0.020	0.035	0.007	0.011	0.037	0.011	0.020	0.024	0.015	0.026	0.037	0.119	0.028	0.008	0.085	0.011	0.008	0.019	1.012	0.007	0.000
Autres services non marchands	0.005	0.002	0.001	0.004	0.003	0.003	0.006	0.009	0.005	0.002	0.003	0.005	0.003	0.001	0.003	0.004	0.002	0.004	0.011	1.001	0.000
Produits de cokerie; pétroliers raffinés	0.009	0.050	0.047	0.011	0.022	0.008	0.015	0.026	0.025	0.075	0.031	0.051	0.047	0.012	0.013	0.016	0.088	0.023	0.028	0.025	1.000
TOTAL	**1.763**	**1.598**	**1.833**	**2.557**	**2.215**	**2.107**	**1.987**	**2.322**	**2.507**	**1.922**	**2.105**	**2.348**	**2.250**	**1.370**	**1.382**	**2.728**	**1.556**	**1.433**	**1.563**	**1.512**	**1.000**
coefficient of imports	***0.220***	***0.120***	***0.520***	***0.520***	***0.520***	***0.520***	***0.520***	***0.520***	***0.520***	***0.520***	***0.520***	***0.520***	***0.520***	***0.140***	***0.140***	***0.140***	***0.140***	***0.140***	***0.140***	***0.140***	***0.120***
part of imports	0.388	0.192	0.953	1.330	1.152	1.095	1.033	1.207	1.304	0.999	1.094	1.221	1.170	0.192	0.193	0.382	0.218	0.201	0.219	0.212	0.120
local products	**1.375**	**1.406**	**0.880**	**1.227**	**1.063**	**1.011**	**0.954**	**1.114**	**1.203**	**0.923**	**1.010**	**1.127**	**1.080**	**1.178**	**1.188**	**2.346**	**1.338**	**1.233**	**1.344**	**1.301**	**0.880**

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